

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 1 1. (Currently amended) A method for selectively monitoring store
2 | instructions to support transactional execution of a process, comprising:
3 | starting a transactional execution of a block of instructions in a program,
4 | wherein starting the transactional execution involves performing an instruction
5 | implemented in hardware to start the transactional execution:
6 | encountering a store instruction during the transactional execution ~~of a~~
7 | ~~block of instructions in a program,~~ wherein changes made during the transactional
8 | execution are not committed to the architectural state of a processor until the
9 | transactional execution successfully completes;
10 | determining whether the store instruction is a monitored store instruction
11 | or an unmonitored store instruction;
12 | if the store instruction is a monitored store instruction,
13 | performing a corresponding store operation, and
14 | store-marking a cache line associated with the store
15 | instruction to facilitate subsequent detection of an interfering data
16 | access to the cache line from another process; and
17 | if the store instruction is an unmonitored store instruction, performing the
18 | corresponding store operation without store-marking the cache line.

1 2. (Original) The method of claim 1, wherein prior to executing the
2 program, the method further comprises generating the instructions for the
3 program, wherein generating the instructions involves:
4 determining whether store operations that take place during transactional
5 execution need to be monitored;
6 generating monitored store instructions for store operations that need to be
7 monitored; and
8 generating unmonitored store instructions for store operations that do not
9 need to be monitored.

1 3. (Original) The method of claim 2, wherein determining whether a store
2 operation needs to be monitored can involve examining a data structure associated
3 with the store operation to determine whether the data structure is a “protected”
4 data structure for which stores need to be monitored, or an “unprotected” data
5 structure for which stores do not need to be monitored.

1 4. (Original) The method of claim 2, wherein determining whether a store
2 operation needs to be monitored can involve determining whether the store
3 operation is directed to a heap, wherein stores from the heap need to be monitored
4 and stores from outside the heap do not need to be monitored.

1 5. (Original) The method of claim 2, wherein determining whether a store
2 operation needs to be monitored can involve allowing a programmer to determine
3 if the store operation needs to be monitored.

1 6. (Original) The method of claim 1, determining whether the store
2 instruction is a monitored store instruction involves examining an op code of the
3 store instruction.

1 7. (Original) The method of claim 1, determining whether the store
2 instruction is a monitored store instruction involves examining an address
3 associated with the store instruction to determine whether the address falls within
4 a range of addresses for which stores are monitored.

1 8. (Original) The method of claim 7, wherein examining the address
2 involves comparing the address with one or more boundary registers.

1 9. (Original) The method of claim 7, wherein examining the address
2 involves examining a Translation Lookaside Buffer (TLB) entry associated with
3 the address.

1 10. (Original) The method of claim 1, wherein if an interfering data access
2 from another process is encountered during transactional execution of the block of
3 instructions, the method further comprises:
4 discarding changes made during the transactional execution; and
5 attempting to re-execute the block of instructions.

1 11. (Original) The method of claim 1, wherein if transactional execution of
2 the block of instructions completes without encountering an interfering data
3 access from another process, the method further comprises:
4 committing changes made during the transactional execution to the
5 architectural state of the processor; and
6 resuming normal non-transactional execution of the program past the
7 block of instructions.

1 12. (Original) The method of claim 1, wherein an interfering data access
2 can include:

3 a store by another process to a cache line that has been load-marked by the
4 process; and
5 a load or a store by another process to a cache line that has been store-
6 marked by the process.

1 13. (Original) The method of claim 1, wherein the cache line is store-
2 marked in the cache level closest to the processor where cache lines are coherent.

1 14. (Original) The method of claim 1, wherein a store-marked cache line
2 indicates at least one of the following:
3 loads from other processes to the cache line should be monitored;
4 stores from other processes to the cache line should be monitored; and
5 stores to the cache line should be buffered until the transactional execution
6 completes.

1 15. (Currently amended) An apparatus that selectively monitors store
2 instructions to support transactional execution of a process, comprising:
3 a start transactional execution mechanism configured to start a
4 transactional execution of a block of instructions in a program, wherein starting
5 the transactional execution involves performing an instruction implemented in
6 hardware to start the transactional execution;
7 an execution mechanism within a processor;
8 wherein the execution mechanism is configured to support the
9 transactional execution of a block of instructions in a program, and wherein
10 changes made during the transactional execution are not committed to the
11 architectural state of a processor until the transactional execution successfully
12 completes;

13 wherein upon encountering a store instruction during transactional
14 execution, the execution mechanism is configured to,
15 determine whether the store instruction is a monitored store
16 instruction or an unmonitored store instruction,
17 if the store instruction is a monitored store instruction, to
18 perform a corresponding store operation, and to store-mark a cache
19 line associated with the store instruction to facilitate subsequent
20 detection of an interfering data access to the cache line from
21 another process; and
22 if the store instruction is an unmonitored store instruction,
23 to perform the corresponding store operation without store-
24 marking the cache line.

1 16. (Original) The apparatus of claim 15, further comprising an instruction
2 generation mechanism configured to:
3 determine whether store operations that take place during transactional
4 execution need to be monitored;
5 generate monitored store instructions for store operations that need to be
6 monitored; and to
7 generate unmonitored store instructions for store operations that do not
8 need to be monitored.

1 17. (Original) The apparatus of claim 16, wherein the instruction
2 generation mechanism is configured to determine whether a store operation needs
3 to be monitored by examining a data structure associated with the store operation
4 to determine whether the data structure is a “protected” data structure for which
5 stores need to be monitored, or an “unprotected” data structure for which stores do
6 not need to be monitored.

1 18. (Original) The apparatus of claim 16, wherein the instruction
2 generation mechanism is configured to determine whether a store operation needs
3 to be monitored by determining whether the store operation is directed to a heap,
4 wherein stores from the heap need to be monitored and stores from outside the
5 heap do not need to be monitored.

1 19. (Original) The apparatus of claim 16, wherein the instruction
2 generation mechanism is configured to determine whether a store operation needs
3 to be monitored by allowing a programmer to determine if the store operation
4 needs to be monitored.

1 20. (Original) The apparatus of claim 15, wherein the execution
2 mechanism is configured to determine whether a store operation needs to be
3 monitored by examining an op code of the store instruction.

1 21. (Original) The apparatus of claim 15, wherein the execution
2 mechanism is configured to determine whether a store operation needs to be
3 monitored by examining an address associated with the store instruction to
4 determine whether the address falls within a range of addresses for which stores
5 are monitored.

1 22. (Original) The apparatus of claim 21, wherein the execution
2 mechanism is configured to examine the address by comparing the address with
3 one or more boundary registers.

1 23. (Original) The apparatus of claim 21, wherein the execution
2 mechanism is configured to examine the address by examining a Translation
3 Lookaside Buffer (TLB) entry associated with the address.

1 24. (Original) The apparatus of claim 15, wherein if an interfering data
2 access from another process is encountered during transactional execution of the
3 block of instructions, the execution mechanism is configured to:
4 discard changes made during the transactional execution; and to
5 attempt to re-execute the block of instructions.

1 25. (Original) The apparatus of claim 15, wherein if transactional
2 execution of the block of instructions completes without encountering an
3 interfering data access from another process, the execution mechanism is
4 configured to:
5 commit changes made during the transactional execution to the
6 architectural state of the processor; and to
7 resume normal non-transactional execution of the program past the block
8 of instructions.

1 26. (Original) The apparatus of claim 15, wherein an interfering data
2 access can include:
3 a store by another process to a cache line that has been load-marked by the
4 process; and
5 a load or a store by another process to a cache line that has been store-
6 marked by the process.

1 27. (Original) The apparatus of claim 15, wherein the cache line is store-
2 marked in the cache level closest to the processor where cache lines are coherent.

1 28. (Original) The apparatus of claim 15, wherein a store-marked cache
2 line indicates at least one of the following:
3 loads from other processes to the cache line should be monitored;

4 stores from other processes to the cache line should be monitored; and
5 stores to the cache line should be buffered until the transactional execution
6 completes.

1 29. (Currently amended) A computer system that selectively monitors
2 store instructions to support transactional execution of a process, comprising:
3 a processor;
4 a memory;
5 a start transactional execution mechanism within the processor configured
6 to start a transactional execution of a block of instructions in a program, wherein
7 starting the transactional execution involves performing an instruction
8 implemented in hardware to start the transactional execution;
9 an execution mechanism within the processor;
10 wherein the execution mechanism is configured to support the
11 ~~transactional execution of a block of instructions in a program~~, wherein changes
12 made during the transactional execution are not committed to the architectural
13 state of a processor until the transactional execution successfully completes;
14 wherein upon encountering a store instruction during transactional
15 execution, the execution mechanism is configured to,
16 determine whether the store instruction is a monitored store
17 instruction or an unmonitored store instruction,
18 if the store instruction is a monitored store instruction, to
19 perform a corresponding store operation, and to store-mark a cache
20 line associated with the store instruction to facilitate subsequent
21 detection of an interfering data access to the cache line from
22 another process; and
23 if the store instruction is an unmonitored store instruction, to perform the
24 corresponding store operation without store-marking the cache line.